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Magnetic reconnection in the Earths bow shock due to kinetic instabilities NAOKI BESSHO, University of Maryland, College Park, LI-JEN CHEN, NASA Goddard Space Flight Center, SHAN WANG, JONATHAN NG, University of Maryland, College Park, MICHAEL HESSE, University of Bergen, LYNN WILSON, NASA Goddard Space Flight Center — MMS observations have revealed reconnecting current sheets in the Earth's bow shock and the magnetosheath. These current sheets may play an important role in shock heating and particle acceleration. We show results from 2D particle-in-cell simulations with parameters similar to Earth's quasi-parallel bow shock. In the shock transition region, we identified two types of waves: a long-wavelength mode (wavelength = a few ion skin depths) and a short-wavelength mode (wavelength < ion skin depth). The long-wavelength mode is propagating toward the shock in the shock frame, obliquely to the magnetic field. This is a right-handed wave excited by an ion beam instability. The obliquity of the wave results in a longitudinal electric fluctuation, which accelerates electrons. The secondary instability due to the electron beam produces the short-wavelength mode, a right-handed wave propagating in the electron flow direction. These waves bend the magnetic field allowing reconnection to occur. Reconnection can occur in two different scales: the scale of several ion skin depths, due to the long-wavelength mode, and the scale of a sub-ion skin depth, due to the short-wavelength mode. In the latter, electron-only reconnection occurs because ions cannot respond to the small-scale structures.

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